The research methods that were considered in Unit 3 and which will again be assessed in Unit 4 are:

• experimental research: construction of research hypotheses; identification of operational independent and dependent variables; identification of extraneous and potential confounding variables including individual participant differences, order effects, experimenter effect, placebo effects; ways of minimising confounding and extraneous variables including type of experiment, counterbalancing, single and double blind procedures, placebos; evaluation of different types of experimental research designs including independent-groups, matched-participants, repeated-measures; reporting conventions

• sampling procedures in selection and allocation of participants: random sampling; stratified sampling; random-stratified sampling; random allocation of participants to groups; control and experimental groups

• techniques of qualitative and quantitative data collection: case studies; observational studies; self reports; questionnaires; interviews; brain imaging and recording technologies

• statistics: measures of central tendency including mean, median and mode; interpretation of p-values and conclusions; reliability including internal consistency; validity including construct and external; evaluation of research in terms of generalising the findings to the population

The following notes are only a sketch of what needs to be known. To cover this thoroughly would entail another 40+ pages of notes.

Use this as a guide only to check your knowledge and understanding. Supplement this outline with readings from your text (use the index to look up concepts/topics) and notes you may have taken in class.

Much of it will have been covered in class as you worked through ERA's so focus more heavily on the sections that appear least familiar.

Experimental research:

construction of research hypotheses – Sometimes referred to as an operational hypothesis, it should provide a clear statement predicting how changes in the independent variable(s) will affect the value of the dependent variable(s). So the independent variable is seen as the proposed "cause" and the dependent variable as the proposed "effect" in the research hypothesis. The way in which the independent and dependent variables will be measured should be explicitly stated in the research hypothesis. It should also clearly state the population from which the sample was drawn and about which the researcher intends to draw conclusions.

identification of operationalised independent and dependent variables -
An **independent variable (IV)** is deliberately manipulated or varied in some way by the experimenter. This is planned before the experiment begins as it forms an important part of the research hypothesis. Simple experiments use one independent variable with two values (male/female; yes/no, pass/fail, dead/alive, etc.). However, there may be more than one IV that is varied (age and sex).
The **dependent variable (DV)** is the property that is measured in the research. Its value depends on the IV and that is why it is called 'dependent'. The DV is therefore the property that the researcher believes will change as a result of changes in the value of the IV. The DV is usually continuous (that is, has any value within a certain range) and should be stated as an operational definition.

identification of extraneous and potential confounding variables –

(i) **individual participant differences** – this refers to individual differences in important personal attributes (such as age, sex, IQ, memory ability, etc.) that could bring about significant differences between the control and experimental groups' results if the mean difference on one or more significant attributes differs considerably. Experimenters choose an experimental design (see different types of experimental research designs, on page 46-47) that will attempt to even out such individual differences.

(ii) **order effect** – this might occur when using a repeated measures experimental design because the participants undertake the procedure twice – once under the *control condition* and once under the *experimental condition* (see page 47). It means that the order under which they take the task could influence the outcome. For example, the participants may get bored and do worse on the second time round, or alternatively, they might do better the second time because of practice. Either way, this is an unwanted variable in any experiment. It can be overcome by using *counterbalancing* (see page 46).

(iii) **experimenter effect** – Experimenter effects occur when the experimenter does something (usually unintentionally) that influences participants in one group to perform better or worse than those in the other group. It may be simply the way they are treated (eg. in a more friendly manner, more engaging, etc.). This can be overcome using a *double-blind procedure* (see page 46).

(iv) **placebo effects** occur when participants perform differently than they would otherwise, due to their belief that they are receiving some sort of "treatment" in an experiment. This can be overcome by using a *single-blind procedure* (see page 46)

ways of minimising confounding and extraneous variables –

(i) **type of experiment** – Different types of experiments, including their designs and procedures, can help to minimise the influence of confounding and extraneous variables. For example if we have a small sample, we would be well advised not to use an independent groups design because we would be more likely to have an inequity in the personal characteristics of the participants of each group. If we had a large sample, then the random allocation to groups – as used in an independent groups design – would probably suffice in overcoming this extraneous variable.

(ii) **counterbalancing** – refers to a procedure designed to overcome any *order effect* (see page 45) that might occur when using a *repeated measures design* (see below). Half the participants do the experimental condition first and the control condition second and the other half do the control condition first and the experimental condition second. In this way, if there is potential for the order of doing the tasks to affect the results, it will be cancelled out because the effect will be on the control condition for half the participants and on the experimental condition for the other half of them. Hence when results for the two conditions are compared, any difference will NOT be due to the *order effect*

(iii) **single and double blind procedures** – the single blind procedure is used to overcome participants having expectations about how they should perform if they think they know whether they are in the control or experimental group. It will therefore overcome the *placebo effect* which is one way this might occur.

(iv) **Placebos** – are fake treatments that are meant to look, feel, smell, taste, etc. the same as the real independent variable, but which should have no effect on the participant's performance. They may be used to overcome *demand characteristics* – demand characteristics are cues expressed by the researcher or aspects of the experimental procedure that might lead the participant to have an expectation about how to behave. Placebos overcome this by not allowing the participant to know whether they're getting the treatment or not.

different types of experimental research designs –

(i) independent-groups – each participant is randomly allocated to one of two (or more) groups that undergo the experimental procedure entirely independently of one another. No attempt is made to balance the groups in terms of participant attributes, so if the sample size is small, there is a risk of important characteristics being imbalanced between the two groups. In that case, it would be better to use one of the two designs described below.

(ii) **matched-participants** – participants are pre-tested (i.e. tested before the experimental procedure begins) on factor(s) thought to be of importance/significance to the outcome of the experiment. The results are scored and participants are matched in pairs as closely as possible. i.e. 1st with 2nd; 3rd with 4th, etc. Then the participants in each pair are randomly allocated to groups. This design makes an attempt to (a) guess which characteristics will be most important and then (b) create an equal distribution of those characteristics between groups.

(iii) **repeated-measures** –a design that controls any individual differences in personal characteristics of participants between the experimental and control conditions because the participants *all* undergo *both conditions* – i.e. there are no separate groups as such. However, this may produce an *order effect* (see page 45) which can be solved by using *counterbalancing* (see above).

reporting conventions – refer to the manner in which reports of research findings should be presented. Generally there is an accepted sequence for this that includes: Title; Abstract; Introduction; Method (including participants, materials and procedure), Results, Discussion (including discussion of results, acceptance or rejection of hypothesis, relevance of results to the general population from which the sample was drawn, consideration of extraneous and potential confounding variables, and ways these might be controlled for if the experiment were repeated), and a Reference section that provides details of citations used in the main body of the report. Referencing follows the Harvard style – the style used by every Psychology text and journal publication in the world.

Sampling procedures in selection and allocation of participants:

random sampling – is a procedure that ensures that every member of the research population has an equal chance of being selected in the sample. For example, drawing names/numbers lottery-style.

stratified sampling – divides the research population into strata (subgroups) and then selecting a separate sample from each subgroup in the same proportions they existed in the research population. The selection of participants to the sample subgroups from the population subgroups is not done on a random basis.

random-stratified sampling – divides the research population into strata (subgroups) and then selecting a separate sample from each subgroup in the same proportions they existed in the research population. The selection of participants to the sample subgroups from the population subgroups is done on a random basis.

random allocation of participants to groups – This refers to the allocation of participants into groups (experimental or control) or conditions (in the case of a repeated measures design) and it is ALWAYS done on a random basis to avoid any bias in the allocation procedure. i.e. each participant has an *equal chance* of ending up in the E-Group or the C-Group.

control and experimental groups – **The *Control group*** serves the purpose of establishing *baseline data* – i.e. the sort of data that occurs without the influence of the independent variable (IV) or "treatment". Without a control group, the results obtained by the ***experimental group*** - in which the IV is at play - would have nothing against which they could be compared. Hence, it would not be possible to determine whether there was a change in the outcome as a result of the IV or not.

Techniques of qualitative and quantitative data collection:

case studies – these involve researchers observing and collecting data of an individual over a long period of time. They therefore gather a great deal of detailed information (strength) which could be used to create a research hypothesis (strength). However, they are extremely time-consuming (weakness) and it isn't possible to generalise findings to others from just one subject (weakness).

observational studies – these are generally of two types:

(a) ***naturalistic observation*** – the observation of voluntary behaviour as it occurs in the subject's natural environment. Preferably this is done without the subject knowing or being aware of the observer's presence.
Strength: very realistic and behaviour not influenced by observer's presence or the artificiality of a foreign setting.
Weakness: Cannot control the IV. Just have to sit and wait for the situation to be right for the behaviour to occur
Example: Paul Broca's study of his patient, 'Tan'.

(b) ***controlled observation*** - the observation of voluntary behaviour in a controlled environment such as a laboratory.
Strength: Control over the environment usually makes the observations more accurate.
Weakness: Participant behaviour may be influenced/altered by the artificial/foreign environment.
Example: Bandura's study of observational learning with 4-year olds.

self reports – these data collection techniques include ***questionnaires, interviews, surveys, Likert scales, diaries,*** and other subjective techniques.

questionnaires – collect data from participants in a written form.
Strengths: easy to administer, score and replicate. Can provide both quantitative and qualitative data such as can be obtained using a Likert scale which involves rating various factors on their weakness or strength as they apply to the participant.
Weakness: May be open to bias - participant may manipulate responses to obtain a desired outcome.
Example: Using a set of questions to assess a participant's risk of suicide, or their state of mental health.

interviews – May be structured or clinical, but necessarily involve researcher interacting with participant. Can provide both quantitative and qualitative data.
Structured interviews ask a series of set questions with a choice of responses such as 'Yes', 'No', or 'Often', 'Sometimes', 'Never'.
Strength: Easy to compare data between participants. Easy to replicate.
Weakness: Data may not be accurate because of limited choice of response.
Example: Interviewing fellow students about the frequency with which they visit the school canteen and/or the quality of the food they purchase there.

Statistics:

measures of central tendency including mean, median and mode –
Mean – the average – add all the values/scores and divide the total by the number of values/scores there are.
Median – the middle value; if there is an even number of data, take the two middle values, add them together, and then divide by two to obtain the median.
Mode – the most often occurring value.

interpretation of p-values and conclusions – Inferential tests can be conducted to see if there is a significant difference between the results obtained from the experimental group compared to those obtained from the control group. Such inferential tests will give a probability that these differences have occurred by chance alone and this probability is expressed as a ***p-value***. Psychologists normally accept a p-value of $\mathbf{p \leq 0.05}$ – i.e. that the probability of the difference in the results between the groups occurring by chance is less than five in 100, or 5%. If this is the case, then the ***conclusion*** will be to accept the original research hypothesis.

reliability including internal consistency – reliability refers to the extent to which the measuring instrument being used in the experiment (eg. a stopwatch, a blood pressure cuff, an observation of an eye blink, etc.) is consistently accurate.

Internal reliability refers to the extent to which all the items in a research instrument contribute equally to the final score. Hence a high correlation between scores on items within a test would indicate strong internal reliability.
Inter-rater reliability refers to obtaining the same results from the instrument regardless of who administers it. This requires procedures to be completely standardised.

validity including construct and external – ***Construct validity*** is one type of ***internal validity***. It refers to whether the instrument can be used to support the theory (or hypothesis) being tested. For example; do particular items on the DSM-IV accurately support a diagnosis of a particular mental illness? ***Content validity*** also measures ***internal validity*** but refers to the extent to which the instrument items measure what it claims they measure.
External validity evaluates whether the results obtained from the sample in the study can be ***generalised to population from which the sample was derived.***

ALL THE RESEARCH METHODS ABOVE WERE REQUIRED FOR THE UNIT 3 EXAM.

WHAT FOLLOWS IS ADDITIONAL MATERIAL (I.E. IN ADDITION TO EVERYTHING ABOVE!) THAT WILL ALSO BE REQUIRED KNOWLEDGE FOR THE UNIT 4 EXAM:

- **Identification of extraneous and potential confounding variables including:**

  [NB These are in addition to the extraneous and potential confounding variables referred to above that were assessable on the Unit 3 exam]

artificiality – refers to a lack of realism and differences to real-life settings under which some investigations are undertaken. The artificiality of the environment in which a study takes place can produce *demand characteristics* that cause participants to react unnaturally. Artificiality can limit the extent to which the results can be generalised from the laboratory setting to real-life contexts. This means that a study conducted in a laboratory setting may be lacking in external validity.

demand characteristic – refers to a cue expressed by the researcher or present in some aspect of the research study that communicates the kind of response that is expected from participants and leads them to believe that the research study requires, or 'demands', that they respond in a particular way. Demand characteristics guide or bias a participant's behaviour in some way.

Non-standardised instructions and procedures - When the research procedures are **non-standardised**, this means that they are not uniform or the same for all participants (except for exposure to the IV by participants in the experimental group). Even small variations in procedures may affect participants' responses in unforeseen ways. An experiment that uses non-standardised procedures is not strictly controlling all of the procedures, and therefore is a source of extraneous and potentially confounding variables that can influence the DV and therefore the results.

- **Ways of minimising confounding and extraneous variables including type of sampling procedures and standardised instructions and procedures:**

Sampling is a very important part of the research process. It is usually undertaken with the goal of being able to use the participants in the sample to make inferences about a larger group known as the population.

The term **population** describes the larger group from which a sample is drawn. The sample should mirror, or be representative of, the entire population of interest.

The use of **standardised instructions** means that the instructions given to all participants for each condition should be predetermined and identical in terms of what they state and how they are given. There should be no

ambiguities or variations for individual participants. Generally, the researcher should describe the sequence of events, identify the stimuli participants should attend to, and explain how to respond. Questions by participants should be anticipated and the specific answers or type of response to be given by the researcher should be predetermined.

- **Sampling procedures in selection and allocation of participants: convenience sampling.**

Convenience sampling involves selecting participants who are readily available without any attempt to make the sample representative of a population. For example, a representative sample of schizophrenic drug users is not often readily available. Consequently, the researcher may go to locations known to be frequented by the required participants and simply select the first individuals they meet who are in the target population and who are willing and available to participate.

Convenience sampling usually produces a *biased sample* because only those people available at the time and location of the study will have a chance of being included in the sample. Since a convenience sample is not representative of the target population under investigation, the data obtained can be misleading and the results of the study cannot be generalised to the entire population. The results therefore have low external validity.

- **Ethical principles and professional conduct: advantages and limitations of the use of animals in research in terms of generalisation and conclusion.**

Advantages:

- ✓ Some studies cannot be conducted with humans due to the risk of psychological and/or physical harm that may be caused, or because suitable human participants are unavailable.
- ✓ Bodily systems and/or behaviours of some animals are similar to those of humans; therefore, using animals can be a starting point for learning more about human behaviour.
- ✓ Animals have practical advantages over people for use as research participants, especially for longitudinal studies. With humans lifespan studies would take more than 80 years, but with rats and mice they can be conducted in a few months.
- ✓ The behaviour of animals can usually be controlled to an extent not possible with human participants. For example, a rat can be raised from birth in a cage. The rat can then be used in a learning experiment and the psychologist will have a good idea of what it has already learned before the experiment is conducted.
- ✓ When certain experiments require large numbers of participants who have, for example, the same genetic background, animals are more easily obtained than humans.
- ✓ Demand characteristics and other participant variables can influence the results research studies; however, animals don't usually have expectations and they are not able to guess the purpose of an experiment.

Limitations:

- ➢ One problem that arises with the use of animals in research relates to the confounding variable of artificiality. Obviously, animal and human responses differ in many ways and external validity considerations mean that generalisation to humans from experiments with animals is not always appropriate.
- ➢ Another argument is that humans should respect animals and protect them from harm rather than use them in research. It is also suggested that humans do not have the right to dominate other species.